Tutorial, Hot Chips Conference
Stanford University
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Morning Session

Overview:
IC Technology Scaling Trends, Challenges, and Potential Solutions through the End of the Semiconductor Roadmap

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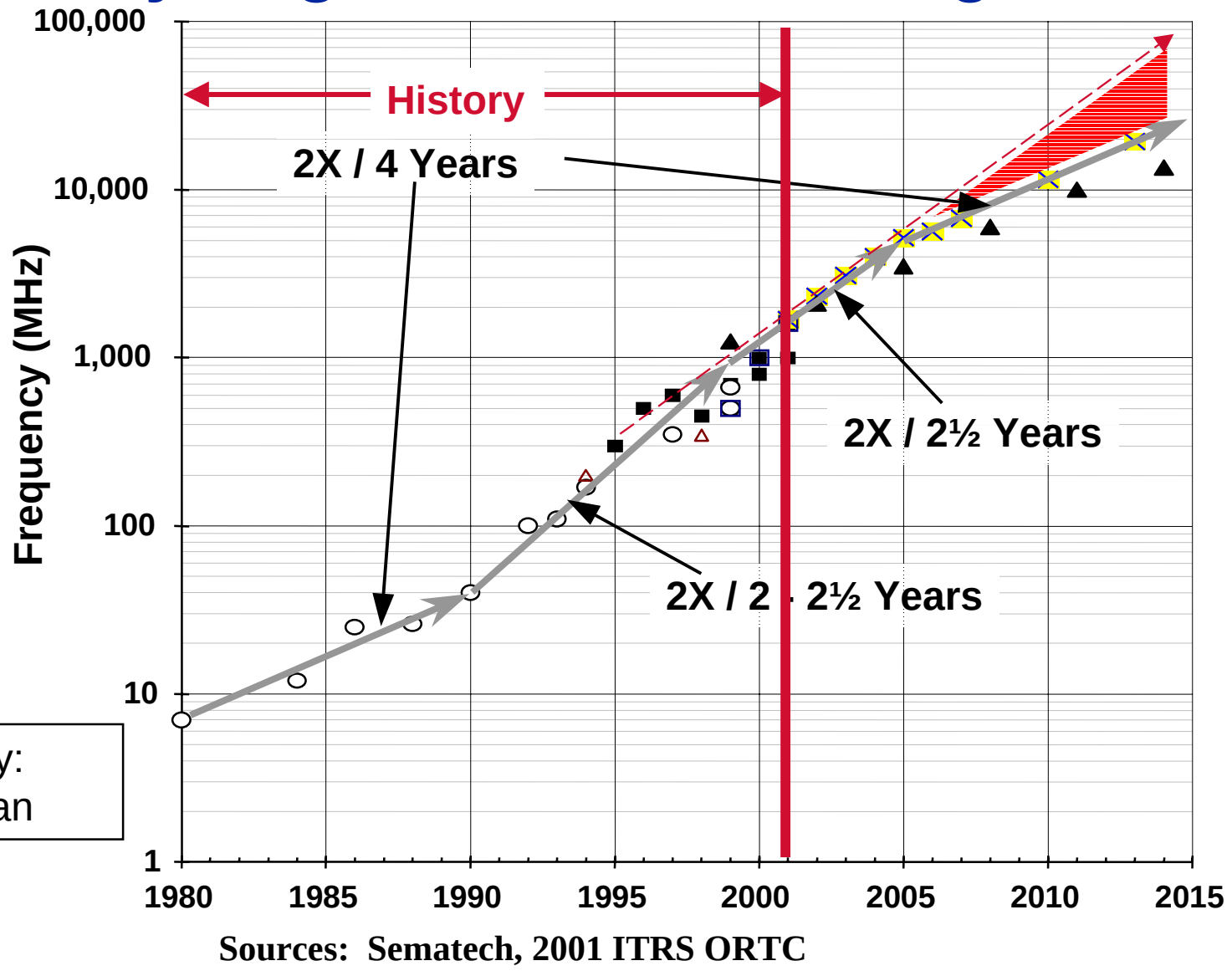
INTERNATIONAL SEMATECH

Introduction: Moore's Law

- **IC industry following Moore's Law because of its benefits**
  - **Increased speed**
  - **Lower power dissipation per function**
  - **Increased transistor and function density**
  - **Lower cost/function**
- **Moore's Law →continuous improvements in design and rapid technology scaling**
  - **IC technology rapidly scaling into deep submicron regime (currently, 130nm technology generation).**

Moore's Law Scaling of Chip Clock Frequency, High-Performance Logic



Courtesy:
Alan Allan

Sources: Sematech, 2001 ITRS ORTC

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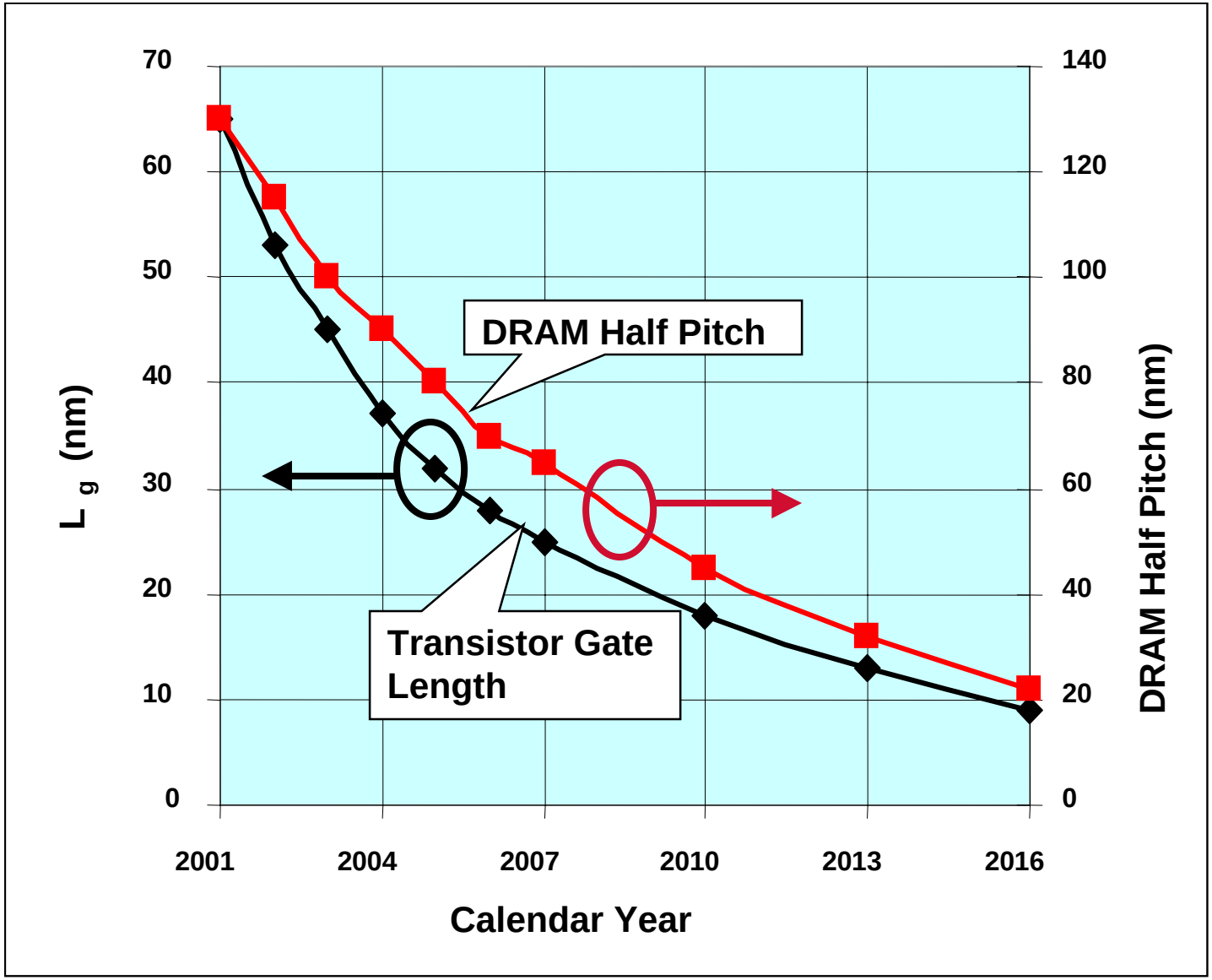
DRAM Half Pitch and Transistor Gate Length Scaling, 2001 ITRS



IC Technology Scaling and Moore's Law

- **The IC industry is committed to follow Moore's law as long as possible to continue to enjoy the benefits**
- **Scaling of transistors and interconnect drives technology scaling**
  - **Rapid scaling of lithography resolution is critical to enabling transistor and interconnect scaling**
- **In this tutorial, we'll discuss:**
  - **Scaling trends, challenges, and potential solutions in 3 key areas**
    - **MOSFETs and front-end processing (Dr. Peter Zeitzoff)**
    - **Interconnect (Dr. Mike Thomas)**
    - **Lithography (Prof. Alfred Wong)**
  - **Scaling of MOSFETs, interconnect, and lithography: impact on chip performance, power dissipation, and functional density**
    - **This technology scaling is the "raw material" that designers work with**
  - **Design-related concerns regarding lithography scaling**
    - **Data, CAD, and design rule issues with OPC and PSM**
    - **Lithography friendly layout**

International Technology Roadmap for Semiconductors (ITRS)

- **Industry-wide effort to project the progress of the IC technology generations for the next 15 years**
  - **Provides common reference for semiconductor industry**
- **Goal: aid the industry to continue following Moore's Law**
- **ITRS will be utilized in this tutorial**